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(54)【発明の名称】　湿式現像方式の画像形成装置に使用される単層型電子写真感光体

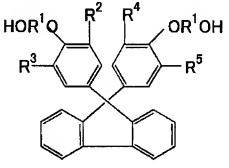
(57)【要約】　（修正有）
【課題】オーバーコートを施さないで、炭化水素系溶媒に浸漬させても感光体表面の外観変化がなく、耐溶媒性に優れ（感光体表面の外観変化がなく、電荷輸送剤の炭化水素系溶媒中への溶出が極めて少ない）、且つ、実用感度を有し、炭化水素系溶媒中にトナー粒子が分散した現像溶液を用いた湿式現像方式の画像形成装置に使用可能な単層型電子写真感光体を提供することである。
【解決手段】導電性基体上に、少なくとも電荷発生剤と、電荷輸送剤を含有するバインダー樹脂からなる感光層を備え、前記バインダー樹脂が、ジオール成分としてジヒドロキシ化合物のうち少なくとも１種を含有し、酸成分としてナフタレンジカルボン酸を少なくとも含有した、実質的に線状の重合体であるポリエステル樹脂を含有し、前記電荷輸送剤が電子輸送剤とホール輸送剤を含有し、且つ、炭化水素系溶媒中にトナー粒子が分散した現像溶液を用いた単層型電子写真感光体。

【特許請求の範囲】

【請求項１】導電性基体上に、少なくとも電荷発生剤と、電荷輸送剤を含有するバインダー樹脂からなる感光層を備え、前記バインダー樹脂が、ジオール成分として一般式［１］、［２］または［３］で示されるジヒドロキシ化合物のうち少なくとも１種を含有し、酸成分として一般式［４］で示されるナフタレンジカルボン酸を少なくとも含有した、実質的に線状の重合体であるポリエステル樹脂を含有し、前記電荷輸送剤が電子輸送剤とホール輸送剤を含有し、且つ、炭化水素系溶媒中にトナー粒子が分散した現像溶液を用いた湿式現像方式の画像形成装置に使用されることを特徴とした単層型電子写真感光体。

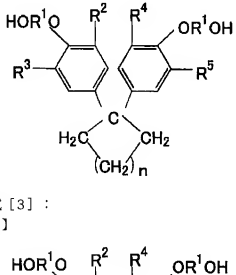
一般式［１］：

【化１】



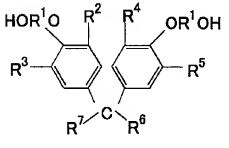
一般式［２］：

【化２】



一般式［３］：

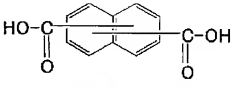
【化３】



（一般式［１］、一般式［２］、一般式［３］中、R^1は炭素数２～４のアルキレン基、R^2、R^3、R^4及びR^5は同一または異なって、水素原子、炭素数１～４のアルキル基、アリール基またはアラルキル基を示す。一般式［２］中、ｎは２以上の整数である。また、一般式［３］中、R^6及びR^7は同一または異なって、炭素数１～１０のアルキル基を示す。）

一般式［４］：

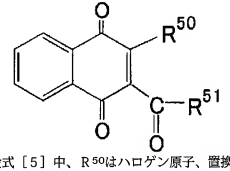
【化４】



【請求項２】前記電子輸送剤が、一般式［５］で示される化合物を含有することを特徴とする請求項１記載の単層型電子写真感光体。

一般式［５］：

【化５】

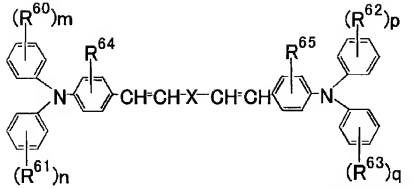


（一般式［５］中、R^{50}はハロゲン原子、置換基を有してもよい、アルキル基またはアリール基を示し、R^{51}は置換基を有してもよい、アルキル基またはアリール基、または基：－Ｏ－R^{51a}を示す。R^{51a}は、置換基を有してもよい、アルキル基またはアリール基を示す。）

【請求項３】前記ホール輸送剤が、一般式［６］で示される化合物を含有することを特徴とする請求項１記載の単層型電子写真感光体。

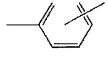
一般式［６］：

【化６】



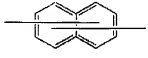
（一般式［６］中、Ｒ60、Ｒ61、Ｒ62及びＲ63は同一または異なって、アルキル基、アルコキシ基、アリール基、アラルキル基、またはハロゲン原子を示し、ｍ、ｎ、ｐ及びｑは同一または異なって０～３の整数を示す。Ｒ64及びＲ65は同一または異なって、水素原子またはアルキル基を示す。また、－Ｘ－は

【化７】



または

【化８】



を示す。）

【請求項４】前記電荷輸送剤の固形分重量が、全固形分重量に対して３５ｗｔ％以上５０ｗｔ％以下であることを特徴とする請求項１記載の単層型電子写真感光体。

【請求項５】前記ホール輸送剤の固形分重量が、前記電子輸送剤とホール輸送剤の固形分重量に対して、２０ｗｔ％以上５０ｗｔ％以下であることを特徴とする請求項１記載の単層型電子写真感光体。

【請求項６】前記電荷発生剤が、フタロシアニン系顔料を含有することを特徴とする請求項１記載の単層型電子写真感光体。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、電子写真式複写機、ファクシミリ、レーザービームプリンタ等の画像形成装置に用いられる電子写真感光体に関するものである。より詳細には、炭化水素系溶媒中にトナー粒子が分散した湿式現像方式を利用した画像形成装置に使用可能な有機の単層型電子写真感光体に関するものである。

【０００２】

【従来の技術】カールソンプロセスを利用した電子写真現像方式は、乾式現像方式と湿式現像方式に大別される。乾式現像方式を用いた画像形成装置は、複写機、プリンタ等、現在広く一般的に使用されているが、湿式現るにもかかわらず、特殊な分野でしか使用されていないのが現状である。

【０００３】しかしながら、湿式現像方式を利用した画像形成装置は、一般に、炭化水素系溶媒中にトナーが分散されており、トナー粒径を１μｍ以下にまですることが可能であるため、得られる画像は非常に高画質となる。このため、近年の高画質が求められるフルカラープリンターの市場拡大にともない、再び脚光を浴びてきている。

【０００４】湿式現像方式を利用した画像形成装置は、前述のように炭化水素系溶媒と呼ばれる溶媒を現像溶液として使用するため、感光体ドラムの全部または一部が、前記炭化水素系溶媒中に浸漬される。炭化水素系溶媒としては、例えば、アイソパーと呼ばれる脂肪族系炭化水素や、パラフィン系溶媒、等が挙げられる。そして、これらの炭化水素系溶媒中に感光体成分が溶出しないセレン、アモルファスシリコン等の無機感光体が使用されているのが一般的である。

【０００５】一方、有機感光体は、従来の無機感光体に比べて製造が容易であり、コストが安く、電荷輸送剤、電荷発生剤、結着樹脂等の感光体材料の選択肢が多様で、機能設計の自由度が高いという利点を有することから、近年、広く用いられている。

【０００６】有機感光体には、電荷輸送剤（ホール輸送剤、電子輸送剤）を電荷発生剤とともに同一の感光層中に分散させた単層型感光体と、電荷発生剤を含有する電荷発生層と電荷輸送剤を含有する電荷輸送層とを積層した積層型感光体とがある。

【０００７】特に、構造が簡単で製造が容易であること、層を形成する際の皮膜欠陥を抑制できること、層間の界面が少なく、光学的特性を向上できること等により、単層型感光体が脚光を浴びている。

【０００８】積層型感光体、単層型感光体は正負いずれの帯電型にも使用することができるが、層構成の順序、及び感光体構成材料の特性等の理由により、一般的に、積層型は負帯電、単層型は正帯電で使用するのが主流となっている。

【０００９】このため、前記湿式現像方式を利用した画像形成装置に一般的に使用されているセレン、アモルフ

め、従来使用されていた無機感光体を、コストの安い有機感光体に置き換える場合においては、単層型有機感光体が、同じ正帯電型であるため有利となる。

【０００１０】

【発明が解決しようとする課題】一般の有機感光体を、湿式現像方式を利用した画像形成装置に使用する場合、前述のように感光体ドラムの全部または一部が前記炭化水素系溶媒中に浸漬されるため、感光体表面にヒビ割れ等の外観変化が発生し、電荷輸送剤（ホール輸送剤または電子輸送剤）等の低分子量物質が炭化水素系溶媒中に溶出し、帯電が低下したり、感度が悪化するといった現象が発生し、良好な画像が得られ難くなる。

【０００１１】そこで、有機感光体の表面にさらにシリコン樹脂、メラミン樹脂、エポキシ樹脂等の熱硬化性樹脂でオーバーコート（表面保護層）を施した有機感光体を使用することにより、前述のアイソパーと呼ばれる脂肪族系炭化水素や、パラフィン系溶媒、等の炭化水素系溶媒に対する耐久性（以下、「耐溶媒性」と略記する）が発現し、電荷輸送剤の溶出を防ぐことが提案されている。しかし、オーバーコートを施すことにより感度が著しく悪化し、また製造コストが高くなるという大きな問題が新たに生じる。

【０００１２】一方、オーバーコートを施さない方法としては、バインダー樹脂自体に電荷輸送能を付与（電荷輸送ポリマー）し、電荷輸送剤の含有率をゼロ、もしくは減少させることにより、耐溶媒性を発現させることが提案されているが、電荷輸送ポリマーの分子設計は非常に困難で、電子写真感光体としての実用感度にはほど遠い。

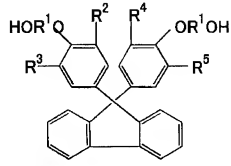
【０００１３】そこで、本発明の目的は、オーバーコートを施さないで、炭化水素系溶媒に浸漬させても感光体表面の外観変化がなく、耐溶媒性に優れ（感光体表面の外観変化がなく、電荷輸送剤の炭化水素系溶媒中への溶出が極めて少ない）、且つ、実用感度を有し、炭化水素系溶媒中にトナー粒子が分散した現像溶液を用いた湿式現像方式の画像形成装置に使用可能な単層型電子写真感光体を提供することである。

【０００１４】

【課題を解決するための手段】本発明者らは鋭意研究の結果、上記目的を達成するために、導電性基体上に、少なくとも電荷発生剤と、電荷輸送剤を含有するバインダー樹脂からなる感光層を備え、前記バインダー樹脂が、ジオール成分として一般式［１］、［２］または［３］で示されるジヒドロキシ化合物のうち少なくとも１種を含有し、酸成分として一般式［４］で示されるナフタレンジカルボン酸を少なくとも含有した、実質的に線状の重合体であるポリエステル樹脂を含有し、前記電荷輸送剤が電子輸送剤とホール輸送剤を含有した単層型電子写真感光体が、炭化水素系溶媒中にトナー粒子が分散しても、耐溶媒性が極めて良好で、感光層中に含有している電荷輸送剤（ホール輸送剤または電子輸送剤）が炭化水素系溶媒中に溶出し難く、良好な画像が得られる事実を見出した。

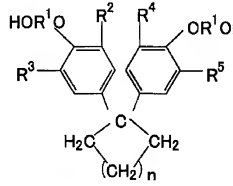
【０００１５】一般式［１］：

【化９】



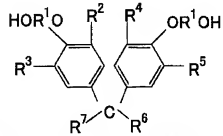
【０００１６】一般式［２］：

【化１０】



【０００１７】一般式［３］：

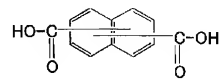
【化１１】



（一般式［１］、一般式［２］、一般式［３］中、R^1は炭素数２～４のアルキレン基、R^2、R^3、R^4及びR^5は同一または異なって、水素原子、炭素数１～４のアルキル基、アリール基またはアラルキル基を示す。一般式［２］中、ｎは２以上の整数である。また、一般式［３］中、R^6及びR^7は同一または異なって、炭素数１～１０のアルキル基を示す。）

【０００１８】一般式［４］：

【化１２】



【発明の詳細な説明】

【０００１９】

【本発明の作用】本発明の単層型電子写真感光体は、炭化水素系溶媒系溶媒を用いた湿式画像形成装置に使用され、導電性基体上に、少なくとも電荷発生剤と、電荷輸送剤を含有するバインダー樹脂からなる感光層を備え、前記バインダー樹脂が、ジオール成分として一般式［１］、［２］または［３］で示されるジヒドロキシ化合物のうち少なくとも１種を含有し、酸成分として一般式［４］で示されるナフタレンジカルボン酸を少なくとも含有した、実質的に線状の重合体であるポリエステル樹脂を含有し、前記電荷輸送剤が電子輸送剤とホール輸送剤を含有することを特徴とする。

【０００２０】本発明の単層型電子写真感光体の耐溶媒性が向上する理由として、感光体ドラムの一部または全部が浸漬される炭化水素系溶媒は、通常、極性が低いため、比較的極性の高い前記ポリエステル樹脂を含有するバインダー樹脂を使用することにより、感光体表面と炭化水素系溶媒との相互作用が小さくなり、電荷輸送剤が炭化水素系溶媒中に溶出し難くなるためと考えられる。

【０００２１】また、前記ポリエステル樹脂は、電荷輸送剤との相溶性が良好であり、電荷輸送剤分子は、バインダー樹脂分子中において均一に分子分散しているため、バインダー樹脂分子との相互作用が強く、炭化水素系溶媒中に溶出し難く、耐溶媒性向上に寄与していると推測される。

【０００２２】

【発明の実施形態】本発明の単層型電子写真感光体は、炭化水素系溶媒を用いた湿式画像形成装置に使用され、少なくとも電荷発生剤と、電荷輸送剤を含有するバインダー樹脂からなる感光層を備え、前記バインダー樹脂が、ジオール成分として一般式［１］、［２］または［３］で示されるジヒドロキシ化合物のうち少なくとも１種を含有し、酸成分として一般式［４］で示されるナフタレンジカルボン酸を少なくとも含有した、実質的に線状の重合体であるポリエステル樹脂を、前記電荷輸送剤が電子輸送剤とホール輸送剤を含有することを特徴とする。

【０００２３】［バインダー樹脂］本発明の単層型電子写真感光体に使用されるバインダー樹脂は、ジオール成分として一般式［１］、［２］または［３］で示されるジヒドロキシ化合物のうち少なくとも１種を含有し、酸成分として一般式［４］で示されるナフタレンジカルボン酸を少なくとも含有した、実質的に線状の重合体であるポリエステル樹脂を含有する。

【０００２４】また、本発明の単層型電子写真感光体に使用されるバインダー樹脂は、少なくとも前記ポリエステル樹脂を含有すればよく、他に、従来から感光層に使用されている種々の樹脂を使用することができる。

ールＺＣ型、ビスフェノールＣ型、ビスフェノールＡ型等のポリカーボネート樹脂、ポリアリレート樹脂を始め、スチレンーブタジエン共重合体、スチレンーアクリロニトリル共重合体、スチレンーマレイン酸共重合体、アクリル共重合体、スチレンーアクリル酸共重合体、ポリエチレン、エチレン一酢酸ビニル共重合体、塩素化ポリエチレン、ポリ塩化ビニル、ポリプロピレン、アイオノマー、塩化ビニル一酢酸ビニル共重合体、アルキド樹脂、ポリアミド、ポリウレタン、ポリスルホン、ジアリルフタレート樹脂、ケトン樹脂、ポリビニルブチラール樹脂、ポリエーテル樹脂等の熱可塑性樹脂、シリコーン樹脂、エポキシ樹脂、フェノール樹脂、尿素樹脂、メラミン樹脂、その他架橋性の熱硬化性樹脂、エポキシアクリレート、ウレタンーアクリレート等の光硬化型樹脂等の樹脂が使用可能である。

【０００２６】上記のバインダー樹脂は、単独または２種以上をブレンドまたは共重合して使用できる。

【０００２７】本発明の電子写真感光体に使用されるバインダー樹脂の重量平均分子量は１０，０００～４００，０００、更には３０，０００～２００，０００が好ましい。

【０００２８】［電荷発生剤］本発明の単層型電子写真感光体に使用される電荷発生剤としては、例えば、無金属フタロシアニン、オキソチタニルフタロシアニン、等のフタロシアニン系顔料、ペリレン系顔料、ビスアゾ顔料、ジオケトピロロピロール顔料、無金属ナフタロシアニン顔料、金属ナフタロシアニン顔料、スクアライン顔料、トリスアゾ顔料、インジゴ顔料、アズレニウム顔料、シアニン顔料、ピリリウム顔料、アンサンスロン顔料、トリフェニルメタン系顔料、スレン顔料、トルイジン系顔料、ピラゾリン系顔料、キナクリドン系顔料といった有機光導電体や、セレン、セレンーテルル、セレンーヒ素、硫化カドミウム、アモルファスシリコンといった無機光導電材料等の、従来公知の電荷発生剤が挙げられる。

【０００２９】上記例示の電荷発生剤は、所望の領域に吸収波長を有するように、単独または２種以上をブレンドして使用できる。

【０００３０】上記例示の電荷発生剤のうち、特に半導体レーザー等の光源を使用したレーザービームプリンタやファクシミリ等のデジタル光学系の画像形成装置には、７００ｎｍ以上の波長領域に感度を有する感光体が必要となるため、例えば無金属フタロシアニン、オキソチタニルフタロシアニン、等のフタロシニン系顔料が好適に使用される。なお、上記フタロシアニン系顔料の結晶型については特に限定されず、種々のものを使用できる。

【０００３１】電荷発生剤は全バインダー樹脂重量に対して０．１～５０ｗｔ％、更には０．５～３０ｗｔ％含有させることが好ましい。

光体に使用される電荷輸送剤は、電子輸送剤とホール輸送剤をともに含有し、従来公知の電子輸送剤またはホール輸送剤を使用することができる。

【００３３】本発明の電子写真感光体に使用可能な電子輸送剤としては、ジフェノキノン誘導体、ベンゾキノン誘導体のほか、アントラキノン誘導体、マロノニトリル誘導体、チオピラン誘導体、トリニトロチオキサントン誘導体、３，４，５，７－テトラニトロ－９－フルオレノン誘導体、ジニトロアントラセン誘導体、ジニトロアクリジン誘導体、ニトロアントラキノン誘導体、ジニトロアントラキノン誘導体、テトラシアノエチレン、２，４，８－トリニトロチオキサントン、ジニトロベンゼン、ジニトロアントラセン、ジニトロアクリジン、ニトロアントラキノン、ジニトロアントラキノン、無水コハク酸、無水マレイン酸、ジブロモ無水マレイン酸等の、電子受容性を有する種々の化合物が挙げられる。

【００３４】本発明において、電子輸送剤は１種のみを使用する他、２種以上をブレンドして使用してもよい。

【００３５】本発明の電子写真感光体に使用可能なホール輸送剤としては、例えばＮ，Ｎ，Ｎ’，Ｎ’－テトラフェニルベンジジン誘導体、Ｎ，Ｎ，Ｎ’，Ｎ’－テトラフェニルフェニレンジアミン誘導体、Ｎ，Ｎ，Ｎ’，Ｎ’－テトラフェニルナフチレンジアミン誘導体、Ｎ，Ｎ，Ｎ’，Ｎ’－テトラフェニルフェナントリレンジアミン誘導体、２，５－ジ（４－メチルアミノフェニル）－１，３，４－オキサジアゾール等のオキサジアゾール系化合物、９－（４－ジエチルアミノスチリル）アントラセン等のスチリル系化合物、ポリビニルカルバゾール等のカルバゾール系化合物、有機ポリシラン化合物、１－フェニル－３－（ｐ－ジメチルアミノフェニル）ピラゾリン等のピラゾリン系化合物、ヒドラゾン系化合物、インドール系化合物、オキサゾール系化合物、イソオキサゾール系化合物、チアゾール系化合物、チアジアゾール系化合物、イミダゾール系化合物、ピラゾール系化合物、トリアゾール系化合物等の含窒素環式化合物や、縮合多環式化合物が挙げられる。

【００３６】本発明において、ホール輸送剤は１種のみを使用する他、２種以上をブレンドして使用してもよい。

【００３７】特に、電子輸送剤として一般式［５］で示される化合物、ホール輸送剤として一般式［６］で示される化合物を使用することが好ましい。

【００３８】これは、前記電子輸送剤または前記ホール輸送剤は、本発明の単層型感光体に使用されるポリエステル樹脂との相溶性が著しく高いため、ポリエステル樹脂との相互作用が非常に大きい。このため、前記ポリエステル樹脂分子中に、前記電子輸送剤分子または前記ホール輸送剤分子が取込まれ易く、炭化水素系溶媒中への溶出が極めて少なくなるためと推測される。

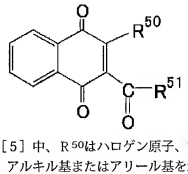
【００３９】また、一般的に電荷輸送剤の含有量が多いほど、感光体の光感度は良好となるが、感光体表面近傍に存在する電荷輸送剤分子の割合も高くなるため、電荷輸送剤が炭化水素系溶媒中へ溶出し易くなり、耐溶媒性が低下する。反対に、電荷輸送剤の含有量が少ないほど、光感度は悪化するが、耐溶媒性は向上する。そこで、光感度と耐溶媒性を両立させるために、全電荷輸送剤の固形分重量を全固形分重量に対して３５ｗｔ％以上５０ｗｔ％以下にすることが好ましい。

【００４０】上記のように、電荷輸送剤の含有量を少なくする場合、高移動度を示す電荷輸送剤を使用するのが好ましいが、一般式［５］で示される電子輸送剤、または一般式［６］で示されるホール輸送剤は、移動度が大きく、比較的少ない含有量でも十分な光感度が発現する。

【００４１】すなわち、一般式［５］で示される電子輸送剤または一般式［６］で示されるホール輸送剤を含有する電荷輸送剤の固形分重量を全固形分重量の３５ｗｔ％以上５０ｗｔ％以下にすることで、炭化水素系溶媒中への溶出が極めて少なく、且つ、高い光感度を有する単層型感光体が得ることができる。更に好ましくは、電荷輸送剤の固形分重量を全固形分重量の４５ｗｔ％以上５０ｗｔ％以下にすることで、より高い光感度を有する単層型感光体が得ることができる。

【００４２】一般式［５］：

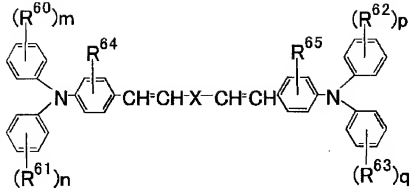
【化１３】



（一般式［５］中、R^{50}はハロゲン原子、置換基を有してもよい、アルキル基またはアリール基を示し、R^{51}は置換基を有してもよい、アルキル基またはアリール基、または基：－Ｏ－R^{51a}を示す。R^{51a}は、置換基を有してもよい、アルキル基またはアリール基を示す。）

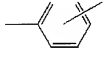
【００４３】一般式［６］：

【化１４】



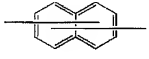
（一般式［６］中、R^{60}、R^{61}、R^{62}及びR^{63}は同一または異なって、アルキル基、アルコキシ基、アリール基、アラルキル基、またはハロゲン原子を示し、m、ｎ、ｐ及びｑは同一または異なって０～３の整数を示す。R^{64}及びR^{65}は同一または異なって、水素原子またはアルキル基を示す。また、－Ｘ－は

【化１５】



または

【化１６】



を示す。）

【００４４】一方、本発明の単層型電子写真感光体に使用されるホール輸送剤の固形分重量は、電荷輸送剤（電子輸送剤とホール輸送剤）の全固形分重量に対して２０ｗｔ％以上５０ｗｔ％以下にすることが好ましく、４０ｗｔ％以上５０ｗｔ％以下にすることが更に好ましい。すなわち、電子輸送剤とホール輸送剤の重量比が、２５：１００～１００：１００の範囲であることが好ましく、６６．７：１００～１００：１００の範囲であることが更に好ましい。

【００４５】これは、ホール輸送剤と電子輸送剤は電荷輸送錯体（ＣＴコンプレックス）を形成する場合が多く、ＣＴコンプレックスは炭化水素系溶媒に対して難溶であり耐溶媒性が向上するが、ホール輸送剤含有量が電子輸送剤含有量よりも大きい場合、ＣＴコンプレックスを形成しない余剰なホール輸送剤は炭化水素系溶媒中に溶出し易いためと考えられる。ただし、前記ホール輸送剤の固形分重量が電子輸送剤とホール輸送剤の全固形分重量に対して３０ｗｔ％未満の場合は光感度が悪化する。

【００４６】特に、一般式［５］で示される電子輸送剤と一般式［６］で示されるホール輸送剤とはＣＴコンプレックスを形成し易い組み合わせであり、該ＣＴコンプあるため、耐溶媒性向上に寄与していると考えられる。

【００４７】本発明の単層型電子写真感光体の感光層膜厚は５～１００μｍ、更には１０～５０μｍ程度が好ましい。感光層には、前述の各成分のほかに、電子写真特性に悪影響を与えない範囲で、従来公知の種々の添加剤、例えば、酸化防止剤、ラジカル補足剤、一重項クエンチャー、紫外線吸収剤等の劣化防止剤、軟化剤、可塑剤、表面改質剤、増量剤、増粘剤、分散安定剤、ワックス、アクセプター、ドナー等を配合することができる。また、感光層の感度を向上させるために、例えば、テルフェニル、ハロナフトキノン類、アセナフチレン等の公知の増感剤を電荷発生剤と併用してもよい。

【００４８】支持体と感光層の間には、感光体の特性を阻害しない範囲でバリア層が形成されていてもよい。

【００４９】感光層が形成される支持体としては、導電性を有する種々の材料を使用することができ、例えば、鉄、アルミニウム、銅、スズ、白金、銀、バナジウム、モリブデン、クロム、カドミウム、チタン、ニッケル、パラジウム、インジウム、ステンレス鋼、真鍮等の金属単体や、上記金属が蒸着またはラミネートされたプラスチック材料、ヨウ化アルミニウム、酸化スズ、酸化インジウム等で被覆されたガラス等があげられる。

【００５０】支持体の形状は、使用する画像形成装置の構造に合わせて、シート状、ドラム状等のいずれであってもよく、支持体自体が導電性を有するか、あるいは支持体の表面が導電性を有していればよい。また、支持体は使用に際して十分な機械的強度を有するものが好ましい。

【００５１】感光層を塗布の方法により形成する場合には、前記例示の電荷発生剤、電荷輸送剤、バインダー樹脂等を適当な溶剤とともに、公知の方法、例えば、ロールミル、ボールミル、アトライタ、ペイントシエーカー、超音波分散機等を用いて分散混合して分散液を調整し、これを公知の手段により塗布して乾燥させればよい。

【００５２】上記分散液を作製するための溶剤としては、種々の有機溶剤が使用可能であり、例えば、メタノール、エタノール、イソプロパノール、ブタノール等の

ン等の脂肪族系炭化水素、ベンゼン、トルエン、キシレン等の芳香族系炭化水素、ジクロロメタン、ジクロロエタン、クロロホルム、四塩化炭素、クロロベンゼン等のハロゲン化炭化水素、ジメチルエーテル、ジエチルエーテル、テトラヒドロフラン、エチレングリコールジメチルエーテル、ジエチレングリコールジメチルエーテル等のエーテル類、アセトン、メチルエチルケトン、シクロヘキサノン等のケトン類、酢酸エチル、酢酸メチル等のエステル類、ジメチルホルムアルデヒド、ジメチルホルムアミド、ジメチルスルホキシド等があげられる。これらの溶剤は単独で、または２種以上混合して用いられる。

【００５３】さらに、電荷発生剤、電荷輸送剤等の分散性、感光層表面の平滑性を良くするために、界面活性剤、レベリング剤等を使用してもよい。

【００５４】

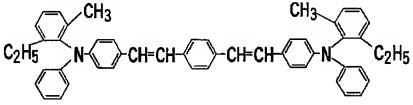
【発明の実施形態】以下、実施例および比較例をあげて本発明を説明する。なお、以下の実施形態は本発明を具体化した一例であって、本発明の技術的範囲を限定するものではない。

【００５５】［実施例１～２７］電荷発生剤としてＸ型無金属フタロシアニン２．５重量部、ホール輸送剤としてＨＴＭ－１～－５から選択された１種（５～８５重量部）、電子輸送剤としてＥＴＭ－１～－３から選択された１種（１５～９５重量部）、バインダー樹脂として重量平均分子量５０，０００のポリエステル樹脂（Ｒｅｓｉｎ－１～－３）１１０重量部を、テトラヒドロフラン４００重量部とともにボールミル中で２４時間分散あるいは溶解させ、単層型感光層用塗布液を作製した。

【００５６】［比較例１～５］バインダー樹脂として、重量平均分子量５０，０００のビスフェノールＺ型ポリカーボネート樹脂（Ｒｅｓｉｎ－４）を使用した以外は、実施例１～５と同様にして単層型感光体用塗布液を作製した。

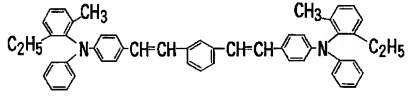
【００５７】［ＨＴＭ－１］

【化１７】



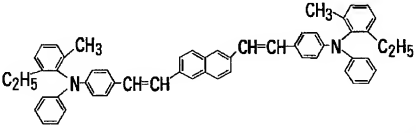
【００５８】［ＨＴＭ－２］

【化１８】



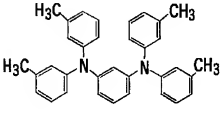
【００５９】［ＨＴＭ－３］

【化１９】



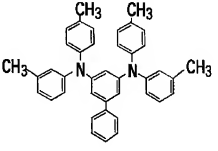
【００６０】［ＨＴＭ－４］

【化２０】



【００６１】［ＨＴＭ－５］

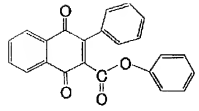
【化２１】



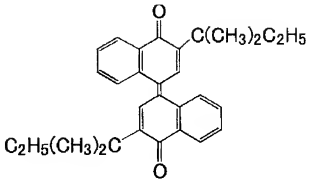
【００６２】［ＥＴＭ－１］

【化２２】

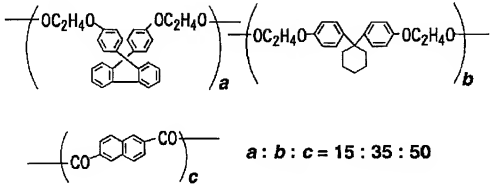
【0063】 [ETM−2]
【化23】



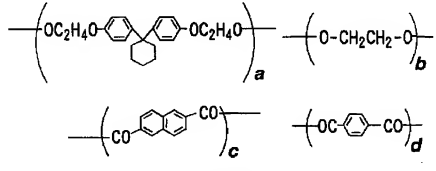
【0064】 [ETM−3]
【化24】



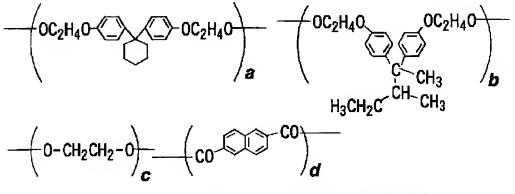
【0065】 [Resin−1]
【化25】



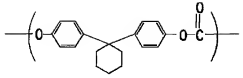
【0066】 [Resin−2]
【化26】



【0067】 [Resin−3]
【化27】



【0068】 [Resin−4]



【００６９】上記各実施例、比較例の感光体について、下記の試験により評価した。

【００７０】＜耐溶媒性試験＞実施例、比較例で得られた塗布液を使用して、アルミ蒸着シート上に膜厚２４μｍの単層型感光層を作製し（熱処理条件１３０℃、３５分）、５ｃｍ×５ｃｍの試験片を得た。次に、上記試験片を１００ｇのアイソパーＧ（脂肪族炭化水素系溶媒）中に密閉系にて、暗所、５０℃で１週間浸漬させた。一方、ホール輸送剤及び電子輸送剤を所定濃度にてアイソパーＧ中に強制溶解させ、ＵＶ測定により、前記ホール輸送剤と電子輸送剤のピーク波長での、濃度－吸光度検量線を作製した。そして、試験片を浸漬したアイソパーＧのＵＶ測定を行い、前記検量線を用いてホール輸送剤及び電子輸送剤のピーク波長での吸光度から、溶出量を算出した。溶出量が少ないほど感光体の耐溶媒性は高い。

【００７１】ホール輸送剤溶出量については０．５×１０$^{-3}$ｍｏｌ／ｌ以下を可、電子輸送剤溶出量については３×１０$^{-3}$ｍｏｌ／ｌ以下を可とした。特に、ホール輸送剤溶出量については０．２５×１０$^{-3}$ｍｏｌ／ｌ以下、電子輸送剤溶出量については２×１０$^{-3}$ｍｏｌ／ｌ以下が特に好ましい。

【００７２】感光体表面の外観変化は、上記試験片をアイソパーＧに、５０℃、暗所にて３週間浸漬させ、取り出した後、アイソパーＧを自然乾燥させ、感光体表面を目視により観察した。

【００７３】感光層表面に変化が無い場合を○、少しのヒビ割れが発生した場合を△、試験片の全面にヒビ割れが発生した場合を×とした。なお、外観変化は、過酷な浸漬試験により評価しているため、前記評価が△であっても、例えば、感光体ドラムの全部ではなく一部がアイソパーＧに浸漬するような湿式画像形成装置等においては、実使用上の問題は無い。

【００７４】＜感度評価試験＞前記耐溶媒性試験評価用に作製した膜厚２４μｍの単層型感光層を形成したアルミ蒸着シートをアルミ素管に貼付け、ＧＥＮＴＥＣ社製のドラム感度試験機を用いて、前記単層型感光層表面に印加電圧を加えて、その表面を＋７００Ｖに帯電させた。そして、露光光源であるハロゲンランプの白色光からバンドパスフィルタを用いて取り出した波長７８０ｎｍの単色光（半値幅２０ｎｍ、１．０μＪ／ｃｍ^2）を露光し、露光開始から０．５秒経過した時点での表面電位を残留電位（V_L）として測定した。残留電位V_Lが低いほど、感光体は高感度であり、２５０Ｖ以下が好ましく、１５０Ｖ以下が特に好ましい。

【００７５】表１、表２に、上記評価試験結果を示した。

【００７６】

【表１】

	ホール輸送剤種類	ホール輸送剤含有量(重量部)	電子輸送剤種類	電荷輸送剤固形分重量(wt%)	バインダー樹脂種類	HTM溶出量 ×10-3(mol/l)	ETM溶出量 ×10-3(mol/l)	感光体表面外観変化
実施例1	HTM-1	45	ETM-1	46.8	Resin-1	0.202	1.097	○
実施例2	HTM-2	45	ETM-1	46.8	Resin-1	0.204	1.903	○
実施例3	HTM-3	45	ETM-1	46.8	Resin-1	0.244	1.934	○
実施例4	HTM-4	45	ETM-1	46.8	Resin-1	0.482	2.410	△
実施例5	HTM-5	45	ETM-1	46.8	Resin-1	0.485	2.612	△
実施例6	HTM-1	45	ETM-2	46.8	Resin-2	0.214	1.938	○
実施例7	HTM-2	45	ETM-2	46.8	Resin-2	0.221	1.942	○
実施例8	HTM-3	45	ETM-2	46.8	Resin-2	0.249	1.976	○
実施例9	HTM-4	45	ETM-2	46.8	Resin-2	0.481	2.517	△
実施例10	HTM-5	45	ETM-2	46.8	Resin-2	0.487	2.509	△
実施例11	HTM-1	45	ETM-3	46.8	Resin-3	0.258	2.124	△
実施例12	HTM-2	45	ETM-3	46.8	Resin-3	0.264	2.248	△
実施例13	HTM-3	45	ETM-3	46.8	Resin-3	0.311	2.378	△
実施例14	HTM-4	45	ETM-3	46.8	Resin-3	0.498	2.517	△
実施例15	HTM-5	45	ETM-3	46.8	Resin-3	0.497	2.834	△
比較例1	HTM-1	45	ETM-1	46.8	Resin-4	0.652	3.712	×
比較例2	HTM-2	45	ETM-1	46.8	Resin-4	0.721	4.014	×
比較例3	HTM-3	45	ETM-1	46.8	Resin-4	0.761	4.125	×
比較例4	HTM-4	45	ETM-1	46.8	Resin-4	0.987	5.421	×
比較例5	HTM-5	45	ETM-1	46.8	Resin-4	1.120	7.123	×

※電荷輸送剤固形分重量(wt%)＝全固形分重量(電荷発生剤＋電荷輸送剤＋バインダー樹脂)に対して

【００７７】

【表２】

	ホール輸送剤種類	ホール輸送剤含有量(重量部)	電子輸送剤種類	電子輸送剤含有量(重量部)	電荷発生剤固形分重量(wt%)	ホール輸送剤固形分重量(wt%)	バインダー樹脂種類	HTM溶出量 ×10⁻⁵(cm²·s)⁻¹	ETM溶出量 ×10⁻⁵(cm²/s)	感光体耐久性能 外観変化	残留電位(V)
実施例16	HTM−1	5	ETM−1	55	34.6	8.3	Resin−1	0.195	2.413	△	250
実施例17	HTM−1	15	ETM−1	55	38.1	21.4	Resin−1	0.191	1.984	○	225
実施例18	HTM−1	25	ETM−1	55	41.2	31.2	Resin−1	0.193	1.946	○	210
実施例19	HTM−1	35	ETM−1	55	44.2	36.9	Resin−1	0.199	1.912	○	160
実施例20	HTM−1	45	ETM−1	55	46.8	45.0	Resin−1	0.202	1.897	○	120
実施例21	HTM−1	55	ETM−1	55	49.2	50.0	Resin−1	0.224	1.932	○	115
実施例22	HTM−1	65	ETM−1	55	51.4	54.2	Resin−1	0.458	2.812	△	113
実施例23	HTM−1	75	ETM−1	55	53.4	57.7	Resin−1	0.492	2.904	△	110
実施例24	HTM−1	5	ETM−1	95	46.8	5.0	Resin−1	0.179	2.876	△	280
実施例25	HTM−1	25	ETM−1	75	49.8	23.0	Resin−1	0.191	1.992	○	245
実施例26	HTM−1	35	ETM−1	65	46.8	35.0	Resin−1	0.207	1.889	△	120
実施例27	HTM−1	85	ETM−1	15	49.8	85.0	Resin−1	0.458	1.872	△	245

※電荷輸送剤固形分重量(wt%)＝全固形分重量(電荷発生剤＋電荷輸送剤＋バインダー樹脂)に対して

※ホール輸送剤固形分重量(wt%)＝電荷輸送剤重量(ホール輸送剤＋電子輸送剤)に対して

【００７８】表１より、バインダー樹脂が、ジオール成分として一般式［１］、［２］または［３］で示されるジヒドロキシ化合物のうち少なくとも１種を含有し、酸成分として一般式［４］で示されるナフタレンジカルボン酸を少なくとも含有した、実質的に線状の重合体であるポリエステル樹脂を含有した実施例の単層型感光体は、バインダー樹脂としてビスフェノールＺ型ポリカーボネート樹脂を使用した比較例の単層型感光体に比べて、アイソパーＧ中に浸漬させても、電荷輸送剤の溶出量が少なく、且つ外観上の変化も殆ど無かった。

【００７９】特に、一般式［５］で示されるホール輸送剤（ＨＴＭ－１～－３）と一般式［６］で示される電子輸送剤（ＥＴＭ－１、－２）との組み合わせ（実施例１～３、６～８）において、アイソパーＧ中への電荷輸送剤の溶出量が最小（ホール輸送剤溶出量０．２５×１０$^{-3}$ｍｏｌ／ｌ以下、電子輸送剤溶出量２×１０$^{-3}$ｍｏｌ／ｌ以下）となり耐溶媒性が良好であった。

【００８０】表２の実施例１６～２３の結果を図１に、実施例２０、２４～２７の結果を図２に示した。

【００８１】図１には、アイソパーＧ中への電荷輸送剤溶出量と、全固形分（電荷発生剤、電荷輸送剤、バインダー樹脂）重量に対する電荷輸送剤固形分重量との関係を示した。電荷輸送剤固形分重量が５０ｗｔ％を超えると、ホール輸送剤（ＨＴＭ）、電子輸送剤（ＥＴＭ）の溶出量が増加した。また、電荷輸送剤固形分重量が３５ｗｔ％より小さいと、残留電位が２５０Ｖより大きくなり感度が悪化した。すなわち、電荷輸送剤固形分重量は３５～５０ｗｔ％が好ましく、特に４５ｗｔ％以上で残留電位が１５０Ｖ以下となり、４５～５０ｗｔ％が更に好ましいことが明らかである。

【００８２】図２には、アイソパーＧ中への電荷輸送剤溶出量と、電荷輸送剤（ホール輸送剤、電子輸送剤）の固形分重量に対するホール輸送剤固形分重量との関係を示した。ホール輸送剤固形分重量が５０ｗｔ％を超えると、電子輸送剤（ＥＴＭ）の溶出量が増加した。また、ホール輸送剤固形分重量が２０ｗｔ％より小さいと、残留電位が２５０Ｖより大きくなり感度が悪化した。すなわち、ホール輸送剤固形分重量は２０～５０ｗｔ％が好ましく、特に４０～７０ｗｔ％の範囲でで残留電位が１５０Ｖ以下となり、４０～５０ｗｔ％が更に好ましいことが明らかである。

【００８３】以上の結果より、バインダー樹脂の種類、電荷輸送剤（ホール輸送剤、電子輸送剤）の種類、電荷輸送剤の含有量、ホール輸送剤と電子輸送剤の含有割合が、感光体の耐溶媒性に大きな影響を及ぼすことが明らかとなったが、最も影響が大きいパラメータは、請求項１記載のバインダー樹脂の種類であった

【００８４】

【発明の効果】導電性基体上に、少なくとも電荷発生剤と、電荷輸送剤を含有するバインダー樹脂からなる感光層を備え、前記バインダー樹脂が、ジオール成分として一般式［１］、［２］または［３］で示されるジヒドロキシ化合物のうち少なくとも１種を含有し、酸成分として一般式［４］で示されるナフタレンジカルボン酸を少なくとも含有した、実質的に線状の重合体であるポリエステル樹脂を含有し、前記電荷輸送剤として、電子輸送剤とホール輸送剤を含有した単層型電子写真感光体が、電荷輸送剤の溶出量が極めて少なく、且つ外観上の変化も無く、炭化水素系溶媒の現像溶液を用いた湿式現像方式の画像形成装置に使用することが可能である。

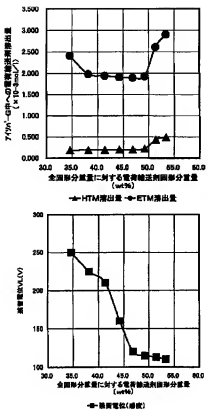
【００８５】

【図面の簡単な説明】

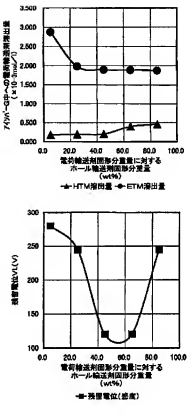
【図１】アイソパーＧ中への電荷輸送剤溶出量と、全固形分（電荷発生剤、電荷輸送剤、バインダー樹脂）重量に対する電荷輸送剤固形分重量との関係を示す図である。

【図２】アイソパーＧ中への電荷輸送剤溶出量と、電荷輸送剤（ホール輸送剤、電子輸送剤）固形分重量に対するホール輸送剤固形分重量との関係を示す図である。

【図１】



【図２】



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(54) MONOLAYER TYPE ELECTROPHOTOGRAPHIC PHOTORECEPTOR USED FOR IMAGE FORMING DEVICE BY WET DEVELOPING METHOD

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a monolayer type electrophotographic photoreceptor which shows no change in the appearance of the photoreceptor surface even when it is immersed in a hydrocarbon solvent without forming an overcoat layer, which has excellent solvent resistance (not only no change in the appearance of the photoreceptor surface but extremely little elution of the charge transfer agent into the hydrocarbon solvent) and practical sensitivity, and which can be used for an image forming device with a wet development method using a developer solution containing toner particles dispersed in a hydrocarbon

solvent.

SOLUTION: The monolayer type electrophotographic photoreceptor has a photosensitive layer consisting of a binder resin containing at least a charge generating agent and a charge transfer agent on a conductive substrate. The binder resin contains a polyester resin which is substantially a linear polymer containing at least one kind of dihydroxy compound as a diol component and containing at least naphthalene dicarboxylic acid as an acid component. The charge transfer agent contains an electron transfer agent and a hole transfer agent. The developer solution to be used contains toner particles dispersed in a hydrocarbon solvent.

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[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

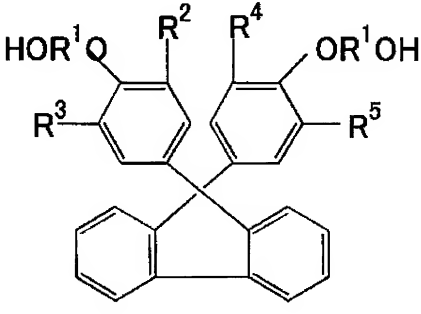
CLAIMS

[Claim(s)]

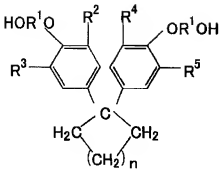
[Claim 1] On a conductive base, it has the sensitization layer which consists of binder resin which contains a charge generating agent and a charge transportation agent at least. Said binder resin contains at least one sort in the dihydroxy compound shown by the general formula [1], [2], or [3] as a diol component. Contained at least the naphthalene dicarboxylic acid shown by the

general formula [4] as an acid component. The monolayer mold electrophotography photo conductor characterized by being used for the image formation equipment of a wet-developing method using the development solution which the polyester resin which is a linear polymer substantially was contained, and said charge transportation agent contained the electronic transportation agent and the hole transportation agent, and the toner particle distributed in the hydrocarbon system solvent.

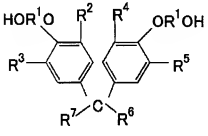
General formula [1]: [Formula 1]



General formula [2]: [Formula 2]

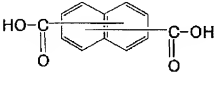


General formula [3]: [Formula 3]



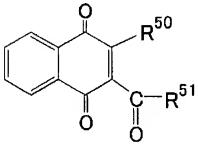
the inside of a general formula [1], a general formula [2], and a general formula [3] and R1 are the alkylene group of carbon numbers 2-4, and R2, R3, R4, and R5 are the same -- or it differs and a hydrogen atom, the alkyl group of carbon numbers 1-4, an aryl group, or an aralkyl radical is shown. n is two or more integers among a general formula [2]. moreover, the inside of a general formula [3], and R6 and R7 are the same -- or it differs and the alkyl group of carbon numbers 1-10 is shown.

General formula [4]: [Formula 4]



[Claim 2] The monolayer mold electrophotography photo conductor according to claim 1 characterized by said electronic transportation agent containing the compound shown by the general formula [5].

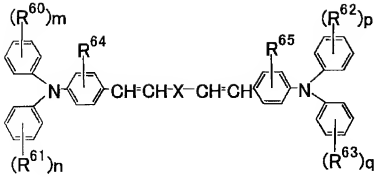
General formula [5]: [Formula 5]



(R50 shows the alkyl group or aryl group which may have a halogen atom and a substituent among a general formula [5], and R51 shows alkyl group or aryl group, or radical:-O-R51a.) [which may have a substituent] R51a shows the alkyl group or aryl group which may have a substituent.

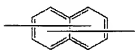
[Claim 3] The monolayer mold electrophotography photo conductor according to claim 1 characterized by said hole transportation agent containing the compound shown by the general formula [6].

General formula [6]: [Formula 6]



the inside of a general formula [6], and R60, R61, R62 and R63 are the same -- or it differs, an alkyl group, an alkoxy group, an aryl group, an aralkyl radical, or a halogen atom is shown, and m, n, p, and q are the same -- or it differs and the integer of 0-3 is shown. R64 and R65 are the same -- or it differs and a hydrogen atom or an alkyl group is shown. Moreover, -X- is [Formula 7].

Or [Formula 8]



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[Claim 4] The monolayer mold electrophotography photo conductor according to claim 1 with which solid content weight of said charge transportation agent is characterized by being less than [more than 35wt%50wt%] to total-solids weight.

[Claim 5] The monolayer mold electrophotography photo conductor according to claim 1 with which solid content weight of said hole transportation agent is characterized by being less than [more than 20wt%50wt%] to the solid content weight of said electronic transportation agent and a hole transportation agent.

[Claim 6] The monolayer mold electrophotography photo conductor according to claim 1 with which said charge generating agent is characterized by containing phthalocyanine pigment.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the electrophotography photo conductor used for image formation equipments, such as an electrophotography type copying machine, facsimile, and a laser beam printer. It is related with an organic monolayer mold electrophotography photo conductor usable to the image formation equipment which used for the detail more the wet-developing method which the toner particle distributed in the hydrocarbon system solvent.

[0002]

[Description of the Prior Art] The electrophotography development method using the Carlsson process is divided roughly into a dry-developing method and a wet-developing method. the image formation equipment using a dry-developing method -- current [, such as a copying machine and a printer,] -- although generally used widely, in spite of developing the image formation equipment using a wet-developing method for many years, the present condition is used only in the special field.

[0003] However, the image with which the image formation equipment using a wet-developing method is obtained since it is possible for the toner to be distributed in the hydrocarbon system solvent generally, and to set toner particle size to 1 micrometer or less serves as high definition very much. For this reason, it is again brought into the limelight with commercial-scene expansion of the full color printer by which high definition in recent years is called for.

[0004] Since the solvent called a hydrocarbon system solvent as mentioned above is used for the image formation equipment using a wet-developing method as a development solution, it is immersed into said hydrocarbon system solvent in all or some of photo conductor drum. As a hydrocarbon system solvent, the aliphatic series system hydrocarbon called Isopar, a paraffin series solvent, etc. are mentioned, for example. And it is common that inorganic photo conductors with which a photo conductor component is not eluted, such as a

selenium and an amorphous silicon, are used into these hydrocarbon system solvents.

[0005] On the other hand, an organic photo conductor is easy to manufacture compared with the conventional inorganic photo conductor, its cost is cheap, and its alternative of photo conductor ingredients, such as a charge transportation agent, a charge generating agent, and binding resin, is various, and it is widely used from having the advantage that the degree of freedom of a functional design is high in recent years.

[0006] There is a laminating mold photo conductor which carried out the laminating of the monolayer mold photo conductor which distributed the charge transportation agent (a hole transportation agent, electronic transportation agent) in the same sensitization layer with the charge generating agent, and the charge generating layer containing a charge generating agent and the charge transportation layer containing a charge transportation agent among the organic photo conductors.

[0007] Especially, there are few interfaces between that the coat defect at the time of forming that structure is easy and manufacture is easy and a layer can be controlled and a layer, and the monolayer mold photo conductor is in the limelight by the ability improving an optical property etc.

[0008] a laminating mold photo conductor and a monolayer mold photo

conductor -- positive/negative -- although it can be used for any electrification mold, it is in use that a laminating mold generally uses negative electrification and a monolayer mold by forward electrification for the reasons of the sequence of lamination, the property of a photo conductor component, etc.

[0009] For this reason, since a monolayer mold organic photo conductor is the same forward electrification mold when transposing the inorganic photo conductor currently used conventionally to the cheap organic photo conductor of cost, since it is usually a forward electrification mold, inorganic photo conductors currently generally used to the image formation equipment using said wet-developing method, such as a selenium and an amorphous silicon, become advantageous.

[00010]

[Problem(s) to be Solved by the Invention] Since it is immersed into said hydrocarbon system solvent in all or some of photo conductor drum as mentioned above when using a common organic photo conductor for the image formation equipment using a wet-developing method, Appearance change of a cracking crack etc. occurs on a photo conductor front face, low-molecular-weight matter, such as a charge transportation agent (a hole transportation agent or electronic transportation agent), is eluted in a hydrocarbon system solvent, the phenomenon in which electrification falls or sensibility gets worse occurs, and a

good image becomes is hard to be obtained.

[0011] Then, by using the organic photo conductor which gave the overcoat (surface protective layer) with thermosetting resin, such as silicon resin, melamine resin, and an epoxy resin, further for the front face of an organic photo conductor, the endurance (it is hereafter written as "solvent-proof nature") over the aliphatic series system hydrocarbon called above-mentioned Isopar and hydrocarbon system solvents, such as a paraffin series solvent, is discovered, and preventing the elution of a charge transportation agent is proposed. However, by giving an overcoat, sensibility gets worse remarkably and the big problem that a manufacturing cost becomes high newly arises.

[0012] Charge transportation ability is given to binder resin itself as an approach of on the other hand not giving an overcoat (charge transportation polymer), and although making solvent-proof nature discover zero or by making it decrease is proposed in the content of a charge transportation agent, the molecular design of a charge transportation polymer is very difficult, and far from the practical speed as an electrophotography photo conductor.

[0013] Then, even if the purpose of this invention makes a hydrocarbon system solvent immersed, it does not have the appearance change on the front face of a photo conductor, without giving an overcoat. It excels in solvent-proof nature (there is no appearance change on the front face of a photo conductor, and there

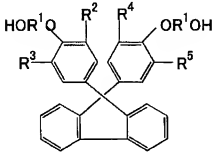
is very little elution to the inside of the hydrocarbon system solvent of a charge transportation agent). And it is providing with an usable monolayer mold electrophotography photo conductor the image formation equipment of a wet-developing method using the development solution which has practical speed and the toner particle's distributed in the hydrocarbon system solvent.

[0014]

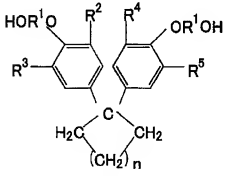
[Means for Solving the Problem] In order that this invention persons may attain the above-mentioned purpose wholeheartedly as a result of research, at least on a conductive base A charge generating agent, It has the sensitization layer which consists of binder resin containing a charge transportation agent. Said binder resin At least one sort in the dihydroxy compound shown by the general formula [1], [2], or [3] as a diol component is contained. Contained at least the naphthalene dicarboxylic acid shown by the general formula [4] as an acid component. The monolayer mold electrophotography photo conductor with which the polyester resin which is a linear polymer substantially was contained, and said charge transportation agent contained the electronic transportation agent and the hole transportation agent Even if it uses it for the image formation equipment of a wet-developing method using the development solution which the toner particle distributed in the hydrocarbon system solvent, solvent-proof nature is very good. The charge transportation agent (a hole transportation

agent or electronic transportation agent) contained in a sensitization layer could not be easily eluted in the hydrocarbon system solvent, and the fact that a good image was obtained was found out.

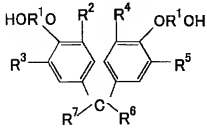
[0015] General formula [1]: [Formula 9]



[0016] General formula [2]: [Formula 10]

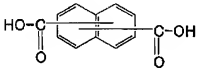


[0017] General formula [3]: [Formula 11]



the inside of a general formula [1], a general formula [2], and a general formula [3] and R1 are the alkylene group of carbon numbers 2-4, and R2, R3, R4, and R5 are the same -- or it differs and a hydrogen atom, the alkyl group of carbon numbers 1-4, an aryl group, or an aralkyl radical is shown. n is two or more integers among a general formula [2]. moreover, the inside of a general formula [3], and R6 and R7 are the same -- or it differs and the alkyl group of carbon numbers 1-10 is shown.

[0018] General formula [4]: [Formula 12]



[Detailed Description of the Invention]

[00019]

[An operation of this invention] The monolayer mold electrophotography photo conductor of this invention is used for the wet image formation equipment which used the hydrocarbon system solvent system solvent. At least on a conductive base A charge generating agent, It has the sensitization layer which consists of binder resin containing a charge transportation agent. Said binder resin At least one sort in the dihydroxy compound shown by the general formula [1], [2], or [3] as a diol component is contained. It is characterized by containing the polyester

resin which contained at least the naphthalene dicarboxylic acid shown by the general formula [4] as an acid component and which is a linear polymer substantially, and said charge transportation agent containing an electronic transportation agent and a hole transportation agent.

[0020] As a reason whose solvent-proof nature of the monolayer mold electrophotography photo conductor of this invention improves, since the polarity is low, when the binder resin which contains said polar high polyester resin comparatively is usually used for the hydrocarbon system solvent immersed in some or all of a photo conductor drum, the interaction of a photo conductor front face and a hydrocarbon system solvent becomes small, and it thinks because a charge transportation agent stops being eluted in a hydrocarbon system solvent easily.

[0021] Moreover, said polyester resin has good compatibility with a charge transportation agent, since molecular dispersion of the charge transportation agent molecule is carried out to homogeneity into the binder pitch child, an interaction with a binder pitch child is strong, and cannot be easily eluted in a hydrocarbon system solvent, and it is surmised that it has contributed on a solvent-proof disposition.

[0022]

[Embodiment of the Invention] The monolayer mold electrophotography photo

conductor of this invention is used for the wet image formation equipment which used the hydrocarbon system solvent. At least A charge generating agent, It has the sensitization layer which consists of binder resin containing a charge transportation agent. Said binder resin At least one sort in the dihydroxy compound shown by the general formula [1], [2], or [3] as a diol component is contained. It is characterized by said charge transportation agent containing an electronic transportation agent and a hole transportation agent for the polyester resin which contained at least the naphthalene dicarboxylic acid shown by the general formula [4] as an acid component and which is a linear polymer substantially.

[0023] The binder resin used for the monolayer mold electrophotography photo conductor of [binder resin] this invention contains the polyester resin which contained at least one sort in the dihydroxy compound shown by the general formula [1], [2], or [3] as a diol component, and contained at least the naphthalene dicarboxylic acid shown by the general formula [4] as an acid component and which is a linear polymer substantially.

[0024] Moreover, the binder resin used for the monolayer mold electrophotography photo conductor of this invention can use for others the various resin currently used for the sensitization layer from the former that what is necessary is just to contain said polyester resin at least.

[0025] For example, a bisphenol Z mold, a bisphenol ZC mold, a bisphenol C mold, Polycarbonate resin, such as the bisphenol A mold, and polyarylate resin are begun. A styrene-butadiene copolymer, a styrene acrylonitrile copolymer, A styrene-maleic-acid copolymer, an acrylic copolymer, a styrene-acrylic-acid copolymer, Polyethylene, an ethylene-vinylacetate copolymer, chlorinated polyethylene, A polyvinyl chloride, polypropylene, an ionomer, a vinyl chloride vinyl acetate copolymer, Alkyd resin, a polyamide, polyurethane, polysulfone, diallyl phthalate resin, Thermoplastics, such as ketone resin, polyvinyl butyral resin, and polyether resin, Resin, such as photo-curing mold resin, such as silicone resin, an epoxy resin, phenol resin, a urea-resin, melamine resin, other thermosetting resin of cross-linking, epoxy acrylate, and urethane-acrylate, is usable.

[0026] Independent or two sorts or more can be used for the above-mentioned binder resin, blending or copolymerizing.

[0027] As for the weight average molecular weight of the binder resin used for the electrophotography photo conductor of this invention, 10,000-400,000, and also 30,000-200,000 are desirable.

[0028] As a charge generating agent used for the monolayer mold electrophotography photo conductor of [charge generating agent] this invention For example, phthalocyanine pigment, such as a non-metal phthalocyanine and

oxo-titanylphthalocyanine, A perylene system pigment, a bis-azo pigment, a JIOKETO pyrrolo pyrrole pigment, a non-metal naphthalocyanine pigment, A metal naphthalocyanine pigment, a SUKUA line pigment, a tris azo pigment, an indigo pigment, An AZURENIUMU pigment, a cyanine pigment, a pyrylium pigment, an anthanthrone pigment, A triphenylmethane color system pigment, the Indanthrene pigment, a toluidine system pigment, a pyrazoline system pigment, Conventionally well-known charge generating agents, such as an organic photo conductor called the Quinacridone system pigment and inorganic photoconduction ingredients, such as a selenium and selenium-tellurium, a selenium-arsenic, a cadmium sulfide, and an amorphous silicon, are mentioned.

[0029] The charge generating agent of the above-mentioned instantiation can blend and use independent or two sorts or more so that it may have absorption wavelength to a desired field.

[0030] Since the photo conductor which has sensibility is needed for a wavelength field 700nm or more, phtalo SHININ system pigments, such as a non-metal phthalocyanine and oxo-titanylphthalocyanine, are suitably used for the image formation equipment of digital optical system, such as a laser beam printer and facsimile, which used especially the light sources, such as semiconductor laser, among the charge generating agents of the above-mentioned instantiation. In addition, it is not limited especially about the

crystal mold of the above-mentioned phthalocyanine pigment, but various things can be used.

[0031] a charge generating agent -- total binder resin weight -- receiving -- 0.1 - 50wt%, and further 0.5 - 30wt % -- it is desirable to make it contain.

[0032] Both the charge transportation agents used for the monolayer mold electrophotography photo conductor of [charge transportation agent] this invention contain an electronic transportation agent and a hole transportation agent, and can use a well-known electronic transportation agent or a hole transportation agent conventionally.

[0033] As an usable electronic transportation agent, to the electrophotography photo conductor of this invention An anthraquinone derivative besides a diphenoquinone derivative and a benzoquinone derivative, A MARONO nitril derivative, a thiopyran derivative, a trinitro thioxan ton derivative, 3, 4, 5, and 7-tetra-nitroglycerine-9-full -- me -- non -- a derivative and a dinitro anthracene derivative -- A dinitro acridine derivative, a nitro ANTOARA quinone derivative, a dinitro anthraquinone derivative, Tetracyanoethylene, 2 and 4, a 8-trinitro thioxan ton, a dinitrobenzene, The various compounds which have electronic receptiveness, such as a dinitro anthracene, a dinitro acridine, nitro anthraquinone, dinitro anthraquinone, a succinic anhydride, a maleic anhydride, and a dibromo maleic anhydride, are mentioned.

[0034] In this invention, an electronic transportation agent uses only one sort, and also may blend and use two or more sorts.

[0035] As an usable hole transportation agent, to the electrophotography photo conductor of this invention For example, N, N, N', an N'- tetra-phenyl benzidine derivative, N and N, N', N'-tetra-phenyl phenylenediamine derivative, N, N, N', an N'- tetra-phenyl naphthylene diamine derivative, N and N, N', N'-tetra-phenyl phenan tolylenediamine derivative, 2, 5-JI (4-methylamino phenyl) - Oxadiazole system compounds, such as 1, 3, and 4-oxadiazole, Styryl system compounds, such as 9-(4-diethylaminostyryl) anthracene, Carbazole system compounds, such as a polyvinyl carbazole, an organic polysilane compound, Pyrazoline system compounds, such as 1-phenyl-3-(p-dimethylaminophenyl) pyrazoline, A hydrazone system compound, the Indore system compound, an oxazole system compound, Nitrogen ring type compounds, such as an isoxazole system compound, a thiazole system compound, a thiadiazole system compound, an imidazole system compound, a pyrazole system compound, and a triazole compound, and a condensed multi-ring type compound are mentioned.

[0036] In this invention, a hole transportation agent uses only one sort, and also may blend and use two or more sorts.

[0037] It is desirable to use the compound especially shown by the general formula [5] as an electronic transportation agent and the compound shown by

the general formula [6] as a hole transportation agent.

[0038] Since compatibility with the polyester resin used for the monolayer mold photo conductor of this invention is remarkable and said electronic transportation agent or said hole transportation agent has it, this has a very large interaction with polyester resin. [high] For this reason, said electronic transportation agent molecule or said hole transportation agent molecule is easy to be incorporated in said polyester resin molecule, and it is guessed for the elution to the inside of a hydrocarbon system solvent to decrease extremely.

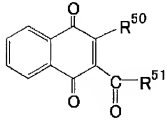
[0039] Moreover, since the rate of the charge transportation agent molecule which exists near the photo conductor front face also becomes high although it becomes good [the photosensitivity of a photo conductor] so that there are generally many contents of a charge transportation agent, a charge transportation agent becomes easy to be eluted into a hydrocarbon system solvent, and solvent-proof nature falls. Although photosensitivity gets worse on the contrary so that there are few contents of a charge transportation agent, solvent-proof nature improves. Then, in order to reconcile photosensitivity and solvent-proof nature, it is desirable to make solid content weight of all charge transportation agents into less than [more than 35wt%50wt%] to total-solids weight.

[0040] As mentioned above, although it is desirable to use the charge

transportation agent which shows high mobility when lessening the content of a charge transportation agent, the electronic transportation agent shown by the general formula [5] or the hole transportation agent shown by the general formula [6] has large mobility, and photosensitivity sufficient also with a comparatively small content discovers it.

[0041] That is, the monolayer mold photo conductor with which the elution to the inside of a hydrocarbon system solvent has high photosensitivity very few can obtain by making into less than [of total-solids weight / more than 35wt%50wt%] solid content weight of the charge transportation agent containing the hole transportation agent shown by the electronic transportation agent or general formula [6] shown by the general formula [5]. Furthermore, the monolayer mold photo conductor which has higher photosensitivity can obtain preferably by making solid content weight of a charge transportation agent into less than [of total-solids weight / more than 45wt%50wt%].

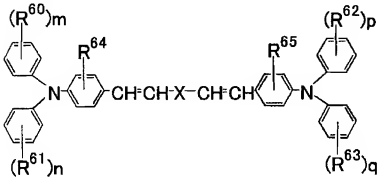
[0042] General formula [5]: [Formula 13]



(R50 shows the alkyl group or aryl group which may have a halogen atom and a

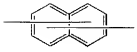
substituent among a general formula [5], and R51 shows alkyl group or aryl group, or radical:-O-R51a.) [which may have a substituent] R51a shows the alkyl group or aryl group which may have a substituent.

[0043] General formula [6]: [Formula 14]



the inside of a general formula [6], and R60, R61, R62 and R63 are the same -- or it differs, an alkyl group, an alkoxy group, an aryl group, an aralkyl radical, or a halogen atom is shown, and m, n, p, and q are the same -- or it differs and the integer of 0-3 is shown. R64 and R65 are the same -- or it differs and a hydrogen atom or an alkyl group is shown. Moreover, -X- is [Formula 15].

Or [Formula 16]



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[0044] As for the solid content weight of the hole transportation agent used for the monolayer mold electrophotography photo conductor of this invention on the other hand, it is desirable to make it less than [more than 20wt%50wt%] to the total-solids weight of a charge transportation agent (an electronic transportation agent and hole transportation agent), and it is still more desirable to make it less than [more than 40wt%50wt%]. That is, it is desirable that the range of the weight ratio of an electronic transportation agent and a hole transportation agent is 25:100-100:100, and it is still more desirable that it is the range of 66.7:100-100:100.

[0045] As for a hole transportation agent and an electronic transportation agent, this forms a charge transportation complex (CT complex) in many cases, and although CT complex is refractory and its solvent-proof nature improves to a hydrocarbon system solvent, when a hole transportation agent content is larger than an electronic transportation agent content, the surplus hole transportation agent which does not form CT complex is considered because it is easy to be eluted in a hydrocarbon system solvent. However, in the case of below 30wt%, photosensitivity gets worse [the solid content weight of said hole transportation agent] to the total-solids weight of an electronic transportation agent and a hole transportation agent.

[0046] Especially the hole transportation agent shown by the electronic

transportation agent shown by the general formula [5] and the general formula [6] is a combination which is easy to form CT complex, and as mentioned above, to a hydrocarbon system solvent, since it is refractory, this CT complex is considered to have contributed on a solvent-proof disposition.

[0047] The sensitization layer membrane thickness of the monolayer mold electrophotography photo conductor of this invention has 5-100 micrometers and desirable about further 10-50 micrometers. Degradation inhibitors, such as well-known various additives, for example, an anti-oxidant, a radical supplement agent, a singlet quencher, and an ultraviolet ray absorbent, a softener, a plasticizer, a surface treatment agent, an extending agent, a thickener, a distributed stabilizer, a wax, an acceptor, a donor, etc. can be conventionally blended with a sensitization layer in the range which does not have a bad influence on the electrophotographic properties other than each above-mentioned component. Moreover, in order to raise the sensibility of a sensitization layer, well-known sensitizers, such as a terphenyl, halo naphthoquinones, and an acenaphthylene, may be used together with a charge generating agent.

[0048] Between the base material and the sensitization layer, the barrier layer may be formed in the range which does not check the property of a photo conductor.

[0049] The glass covered with the plastic material which could use the various ingredients which have conductivity as a base material with which a sensitization layer is formed, for example, metal simple substances, such as iron, aluminum, copper, tin, platinum, silver, vanadium, molybdenum, chromium, cadmium, titanium, nickel, palladium, an indium, stainless steel, and brass, and the above-mentioned metal vapor-deposited or laminated, an aluminium iodide, the tin oxide, indium oxide, etc. is raised.

[0050] According to the structure of the image formation equipment which uses the configuration of a base material, you may be any, such as the shape of the shape of a sheet, and a drum, and the base material itself has conductivity, or the front face of a base material should just have conductivity. Moreover, as for a base material, what has sufficient mechanical strength on the occasion of use is desirable.

[0051] What is necessary is to carry out distributed mixing of the charge generating agent of said instantiation, a charge transportation agent, the binder resin, etc. with a suitable solvent using a well-known approach, for example, a roll mill, a ball mill, attritor, a paint shaker, an ultrasonic disperser, etc., to adjust dispersion liquid, to apply this with a well-known means and just to dry it, in forming by the approach of spreading of a sensitization layer.

[0052] As a solvent for producing the above-mentioned dispersion liquid, various

organic solvents are usable. For example, alcohols, such as a methanol, ethanol, isopropanol, and a butanol, Aliphatic series system hydrocarbons, such as n-hexane, an octane, and a cyclohexane, benzene, Aromatic series system hydrocarbons, such as toluene and a xylene, dichloromethane, a dichloroethane, Halogenated hydrocarbon, such as chloroform, a carbon tetrachloride, and a chlorobenzene, Wood ether, diethylether, a tetrahydrofuran, ethylene glycol wood ether, Ester, such as ketones, such as ether, such as diethylene-glycol wood ether, an acetone, a methyl ethyl ketone, and a cyclohexanone, ethyl acetate, and methyl acetate, dimethyl formaldehyde, dimethylformamide, dimethyl sulfoxide, etc. are raised. These solvents are independent, or two or more sorts are mixed and they are used.

[0053] Furthermore, in order to improve dispersibility, such as a charge generating agent and a charge transportation agent, and smooth nature of a sensitization layer front face, a surface active agent, a leveling agent, etc. may be used.

[0054]

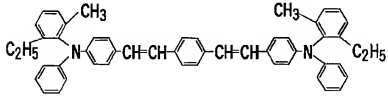
[Embodiment of the Invention] Hereafter, an example and the example of a comparison are given and this invention is explained. In addition, the following operation gestalten are examples which materialized this invention, and do not limit the technical range of this invention.

[0055] As a [examples 1-27] charge generating agent, the X type non-metal phthalocyanine 2.5 weight section, One sort chosen from HTM-1--5 as a hole transportation agent (5 - 85 weight section), One sort chosen from ETM-1--3 as an electronic transportation agent (15 - 95 weight section), As binder resin, the polyester resin (Resin-1--3) 110 weight section of weight average molecular weight 50,000 was distributed or dissolved in the ball mill with the tetrahydrofuran 400 weight section for 24 hours, and the coating liquid for monolayer mold sensitization layers was produced.

[0056] As [examples 1-5 of comparison] binder resin, the coating liquid for monolayer mold photo conductors was produced like examples 1-5 except having used the bisphenol Z mold polycarbonate resin (Resin-4) of weight average molecular weight 50,000.

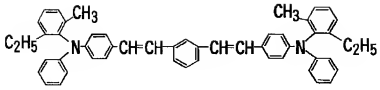
[0057] [HTM-1]

[Formula 17]



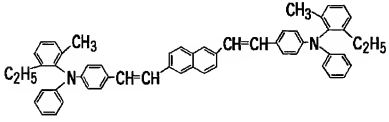
[0058] [HTM-2]

[Formula 18]



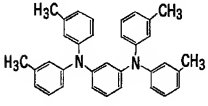
[0059] [HTM-3]

[Formula 19]



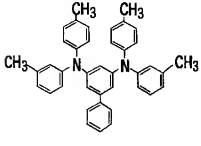
[0060] [HTM-4]

[Formula 20]



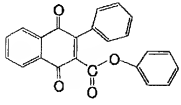
[0061] [HTM-5]

[Formula 21]



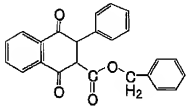
[0062] [ETM-1]

[Formula 22]



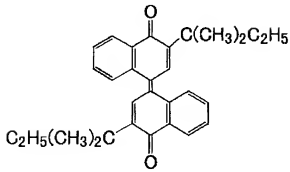
[0063] [ETM-2]

[Formula 23]



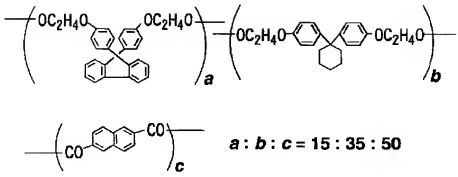
[0064] [ETM-3]

[Formula 24]



[0065] [Resin-1]

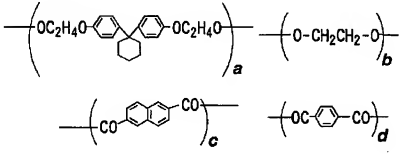
[Formula 25]



a : b : c = 15 : 35 : 50

[0066] [Resin-2]

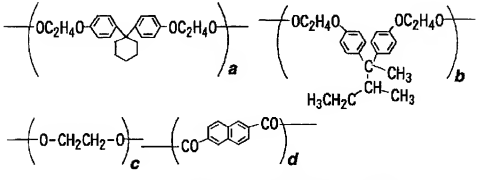
[Formula 26]



a : b : c : d = 35 : 15 : 35 : 15

[0067] [Resin-3]

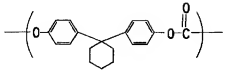
[Formula 27]



a : b : c : d = 30 : 10 : 10 : 50

[0068] [Resin-4]

[Formula 28]



[0069] The following trial estimated the photo conductor of each above-mentioned example and the example of a comparison.

[0070] The coating liquid obtained in the <solvent-proof sex-test> example and the example of a comparison was used, the monolayer mold sensitization layer of 24 micrometers of thickness was produced on the aluminum vacuum evaporationo sheet (130 degrees C of heat treatment conditions, 35 minutes), and the 5cmx5cm test piece was obtained. Next, the above-mentioned test piece was made immersed for one week at a dark place and 50 degrees C in a sealing system into 100g Isopar G (aliphatic hydrocarbon system solvent). On the other hand, the forcible dissolution of a hole transportation agent and the electronic transportation agent was carried out into Isopar G by predetermined concentration, and the concentration-absorbance calibration curve in the peak wavelength of said hole transportation agent and an electronic transportation agent was produced by UV measurement. And UV measurement of Isopar G immersed in the test piece was performed, and the elution volume was

computed using said calibration curve from the absorbance in the peak wavelength of a hole transportation agent and an electronic transportation agent. The solvent-proof nature of a photo conductor is so high that there are few elution volumes.

[0071] About the hole transportation agent elution volume, 0.5x10 to 3 mol/less thanl. was made good [3x10 to 3 or less mol/l] about good and an electronic transportation agent elution volume. About 0.25x10 to 3 or less mol/l, and especially an electronic transportation agent elution volume especially, 2x10 to 3 or less mol/l is [elution volume / hole transportation agent] desirable.

[0072] After the appearance change on the front face of a photo conductor made Isopar G immersed for three weeks in 50 degrees C and a dark place and took out the above-mentioned test piece, it made Isopar G season naturally and observed the photo conductor front face by viewing.

[0073] The case where a cracking crack generated the case where O and some cracking cracks generate the case where there is no change in a sensitization layer front face, all over ** and a test piece was made into x. In addition, since the severe immersion test is estimating appearance change, even if said evaluation is **, there is no problem on real use in wet image formation equipment with which it is not all of photo conductor drums, and a part is immersed in Isopar G, for example.

[0074] <Sensitivity-evaluation trial> The aluminum vacuum evaporationo sheet in which the monolayer mold sensitization layer of 24 micrometers of thickness produced to said solvent-proof sex-test evaluation was formed was stuck on the aluminum element tube, applied voltage was applied to said monolayer mold sensitization layer front face using the drum sensitivity test machine made from GENTEC, and the front face was electrified in +700V. And the homogeneous light (half-value width of 20nm, 1.0microJ/cm2) with a wavelength of 780nm taken out from the white light of the halogen lamp which is the exposure light source using the band pass filter was exposed, and the surface potential in the time of 0.5 seconds having passed since exposure initiation was measured as rest potential (VL). It is high sensitivity, as for a photo conductor, less than [250V] is desirable, and especially less than [150V] is so desirable that rest potential VL is low.

[0075] The above-mentioned evaluation test result was shown in Table 1 and Table 2.

[0076]

[Table 1]

	ホール輸送剤種類	ホール輸送剤含有量(重量部)	電子輸送剤種類(55重量部)	電荷輸送剤固形分重量(wt%)	バインダー樹脂種類	HTM溶出量 ×10-3(mol/l)	ETM溶出量 ×10-3(mol/l)	感光体表面外観変化
実施例1	HTM-1	45	ETM-1	46.8	Resin-1	0.202	1.897	○
実施例2	HTM-2	45	ETM-1	46.8	Resin-1	0.204	1.903	○
実施例3	HTM-3	45	ETM-1	46.8	Resin-1	0.244	1.934	○
実施例4	HTM-4	45	ETM-1	46.8	Resin-1	0.462	2.410	△
実施例5	HTM-5	45	ETM-1	46.8	Resin-1	0.485	2.612	△
実施例6	HTM-1	45	ETM-2	46.8	Resin-2	0.214	1.938	○
実施例7	HTM-2	45	ETM-2	46.8	Resin-2	0.221	1.942	○
実施例8	HTM-3	45	ETM-2	46.8	Resin-2	0.249	1.978	○
実施例9	HTM-4	45	ETM-2	46.8	Resin-2	0.481	2.517	△
実施例10	HTM-5	45	ETM-2	46.8	Resin-2	0.487	2.509	△
実施例11	HTM-1	45	ETM-3	46.8	Resin-3	0.258	2.124	△
実施例12	HTM-2	45	ETM-3	46.8	Resin-3	0.264	2.248	△
実施例13	HTM-3	45	ETM-3	46.8	Resin-3	0.311	2.378	△
実施例14	HTM-4	45	ETM-3	46.8	Resin-3	0.498	2.517	△
実施例15	HTM-5	45	ETM-3	46.8	Resin-3	0.497	2.834	△
比較例1	HTM-1	45	ETM-1	46.8	Resin-4	0.852	3.712	×
比較例2	HTM-2	45	ETM-1	46.8	Resin-4	0.721	4.014	×
比較例3	HTM-3	45	ETM-1	46.8	Resin-4	0.761	4.125	×
比較例4	HTM-4	45	ETM-1	46.8	Resin-4	0.967	5.421	×
比較例5	HTM-5	45	ETM-1	46.8	Resin-4	1.120	7.123	×

※電荷輸送剤固形分重量(wt%)＝全固形分重量(電荷発生剤＋電荷輸送剤＋バインダー樹脂)に対して

[0077]

[Table 2]

	ホール輸送剤種類	ホール輸送剤含有量(重量部)	電子輸送剤種類	電子輸送剤含有量(重量部)	電荷輸送剤固形分重量(wt%)	バインダー樹脂種類	HTM溶出量 ×10-3(mol/l)	ETM溶出量 ×10-3(mol/l)	感光体表面外観変化	残留電位VL V
実施例16	HTM-1	5	ETM-1	65	34.0	9.3	Resin-1	0.195	2.413	△	250
実施例17	HTM-1	15	ETM-1	65	38.1	21.4	Resin-1	0.191	1.984	○	225
実施例18	HTM-1	25	ETM-1	65	41.3	31.2	Resin-1	0.193	1.942	○	210
実施例19	HTM-1	35	ETM-1	65	44.2	36.2	Resin-1	0.199	1.912	○	160
実施例20	HTM-1	45	ETM-1	65	46.8	45.0	Resin-1	0.202	1.897	○	120
実施例21	HTM-1	55	ETM-1	65	49.2	50.0	Resin-1	0.224	1.932	○	115
実施例22	HTM-1	65	ETM-1	65	51.4	54.2	Resin-1	0.438	2.812	△	113
実施例23	HTM-1	75	ETM-1	65	53.4	57.7	Resin-1	0.462	2.904	△	110
実施例24	HTM-1	5	ETM-1	95	46.8	5.0	Resin-1	0.179	2.979	△	290
実施例25	HTM-1	25	ETM-1	75	46.8	29.0	Resin-1	0.191	1.982	○	245
実施例26	HTM-1	85	ETM-1	35	46.8	86.0	Resin-1	0.397	1.899	△	120
実施例27	HTM-1	95	ETM-1	15	46.8	95.0	Resin-1	0.459	1.872	△	245

※電荷輸送剤固形分重量(wt%)＝全固形分重量(電荷発生剤＋電荷輸送剤＋バインダー樹脂)に対して
※ホール輸送剤固形分重量(wt%)＝電荷輸送剤重量(ホール輸送剤＋電子輸送剤)に対して

[0078] From Table 1, binder resin contains at least one sort in the dihydroxy compound shown by the general formula [1], [2], or [3] as a diol component. The monolayer mold photo conductor of the example containing the polyester resin which is a linear polymer substantially which contained at least the naphthalene dicarboxylic acid shown by the general formula [4] as an acid component Even if

you made it immersed into Isopar G compared with the monolayer mold photo conductor of the example of a comparison which used bisphenol Z mold polycarbonate resin as binder resin, most exterior change did not have the elution volume of a charge transportation agent few.

[0079] In combination (examples 1-3, 6-8) with the electronic transportation agent (ETM-1, -2) shown by the hole transportation agent (HTM-1--3) especially shown by the general formula [5], and the general formula [6] The elution volume of the charge transportation agent to the inside of Isopar G became min (0.25x10 to 3 or less mol/l of hole transportation agent elution volumes, 2x10 to 3 or less mol/l of electronic transportation agent elution volumes), and solvent-proof nature was good.

[0080] The result of the examples 16-23 of Table 2 was shown in drawing 1 , and the result of examples 20, 24-27 was shown in drawing 2 .

[0081] The relation between the charge transportation agent elution volume to the inside of Isopar G and the charge transportation agent solid content weight to total-solids (charge generating agent, charge transportation agent, binder resin) weight was shown in drawing 1 . When charge transportation agent solid content weight exceeded 50wt(s)%, the elution volume of a hole transportation agent (HTM) and an electronic transportation agent (ETM) increased. Moreover, when charge transportation agent solid content weight was smaller than

35wt(s)%, rest potential became larger than 250V, and sensibility got worse. That is, 35 - 50wt% is desirable, rest potential becomes less than [150V] more than at 45wt% especially, and it is clear that charge transportation agent solid content weight's 45 - 50wt% is still more desirable.

[0082] The relation between the charge transportation agent elution volume to the inside of Isopar G and the hole transportation agent solid content weight to the solid content weight of a charge transportation agent (a hole transportation agent, electronic transportation agent) was shown in drawing 2 . When hole transportation agent solid content weight exceeded 50wt(s)%, the elution volume of an electronic transportation agent (ETM) increased. Moreover, when hole transportation agent solid content weight was smaller than 20wt(s)%, rest potential became larger than 250V, and sensibility got worse. That is, 20 - 50wt% is desirable, it is in the range of 40 - 70wt%, rest potential becomes less than [150V], and it is especially clear that hole transportation agent solid content weight's 40 - 50wt% is still more desirable.

[0083] It is [0084] whose parameter with the largest effect was the class of binder resin according to claim 1 although it became clear from the above result that the class of binder resin, the class of charge transportation agent (a hole transportation agent, electronic transportation agent), the content of a charge transportation agent, and the content rate of a hole transportation agent and an

electronic transportation agent do the big effect to the solvent-proof nature of a photo conductor.

[Effect of the Invention] On a conductive base, it has the sensitization layer which consists of binder resin which contains a charge generating agent and a charge transportation agent at least. Said binder resin contains at least one sort in the dihydroxy compound shown by the general formula [1], [2], or [3] as a diol component. The polyester resin which contained at least the naphthalene dicarboxylic acid shown by the general formula [4] as an acid component and which is a linear polymer substantially is contained. As said charge transportation agent The monolayer mold electrophotography photo conductor containing an electronic transportation agent and a hole transportation agent is able for the elution volume of a charge transportation agent not to have an exterior change very few, and to use it for the image formation equipment of a wet-developing method using the development solution of a hydrocarbon system solvent.

[0085]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is drawing showing the relation between the charge transportation agent elution volume to the inside of Isopar G, and the charge transportation agent solid content weight to total-solids (charge generating agent, charge transportation agent, binder resin) weight.

[Drawing 2] It is drawing showing the relation between the charge transportation agent elution volume to the inside of Isopar G, and the hole transportation agent solid content weight to charge transportation agent (hole transportation agent, electronic transportation agent) solid content weight.